The Sight-Saving Review

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Nutrition and Vision*

Robert S. Goodhart, M.D.

DESCRIBES visual disturbances associated with malnutrition according to the principal parts of the visual mechanism.

VISION, that is, the reception of light, form and color by the retina, the transmission of images over the optic nerve and the interpretation of them within the cerebral cortex is a complex phenomenon. It involves not only the eye itself and its complicated intrinsic apparatus but, also, the central nervous system, the extrinsic muscles of the eyes and eyelids and their nerves, the fossa in which the eye rests and the vascular bed through which necessary sustaining substances are supplied to the visual mechanism. Obviously, vision may be adversely affected by a variety of general and local conditions, with or without direct involvement of the eye. This is illustrated by the effects of nutritional disorder upon vision.

In this discussion, I shall attempt to break down the disturbances of vision associated with malnutrition according to the principal parts of the visual mechanism involved; but, first, a few words about developmental abnormalities. Warkany and his associates[1] have shown incontrovertibly that congenital malformations may be caused by maternal malnutrition. They found also that rats born to mothers deficient in vitamin A had abnormal eyes.[2] Congenital blindness and malformations of the eye occur also in the offspring of female pigs deficient in vitamin A[3] and blindness, associated with a constriction of the optic nerve of probable nutritional origin, has been described in cattle.[4] I have been unable to find any references on the relation of maternal malnutrition to visual abnormalities of the offspring in man, but, that there is a relationship, in man,

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between the nutritional health of mothers and the incidence of congenital defects in their children has been established by the work of Tisdall,[5] Burke,[6] Tompkins[7] and others. Certainly ophthalmologists, as well as practitioners of other branches of medicine, should take an interest in the nutritional status of mothers-to-be and should be concerned with the possible relationship between maternal malnutrition and the incidence and types of eye defects to be found in the offspring.

Malnutrition and Abnormalities of the Retina and Choroid

One of the oldest diseases known to man is the failure of vision in dim light, commonly known as night blindness (hemeralopia, nyctalopia). It has been observed wherever malnutrition has been prevalent and is one of the most generally accepted signs of vitamin A deficiency. It is unique among nutritional deficiencies in not being simply one of several related manifestations of a general systemic disorder. It is an expression of an immediate disturbance in the visual mechanism itself.

Largely through the work of Wald[8, 9] it is known that the ability to see under dim illumination is due to the visual purple (rhodopsin) of the rod cells of the retina. Vitamin A is a precursor of visual purple. The visual cycle is initiated when light falls upon the retina. Visual purple is broken down and bleached to visual yellow (retinene-protein). Some of the visual yellow may regenerate a small amount of visual purple but most of it is further broken down to colorless vitamin A and protein. As some vitamin A is lost in each cycle, it is essential that the supply be continuously replenished. In vitamin A deficiency, regeneration of visual purple is delayed or decreased and vision in dim light is impaired.

The incidence of functional night blindness due to vitamin A deficiency in this country is unknown. It is seldom recognized in very young children and frequently develops so insidiously that it is recognized late in adults. The body's ability to store vitamin A is great and, for this reason, individuals often can maintain themselves on vitamin A deficient diets for long periods of time without demonstrating clinically detectable deficiency.

Common complaints related to night blindness are difficulty in sewing and reading at night unless the light is brilliant, dancing of

letters on the page, poor vision exaggerated by weak light, photophobia, glittering images and dancing specks. As exposure to strong light aggravates the defectiveness of vision in poor light, vision is better in the morning than in the evening because of exposure to light during the day.[10]

Functional nutritional disturbances, such as the synthesis of the photoreceptor substances of the retina, usually respond rapidly to treatment and nutritional night blindness usually is corrected rapidly by administering therapeutic amounts of vitamin A.[11] The value of the use of the many instruments introduced for measuring relatively minor degrees of night blindness is a subject of dispute. Where functional impairment of vision in dim light is considered to exist, a therapeutic trial with vitamin A is indicated.

Yudkin[12] has described a condition of ocular distress occurring particularly in blond persons which does not respond to the correction of refractive errors and other measures of direct treatment of the eye, but which does respond to improvement of the diet and multivitamin therapy. He states that many of these people show a mottled chorioretinitis, particularly in the macular area and temporal part of the retina, and postulates that some conditions may be present in these persons which interfere with the assimilation and utilization of food substances.

Malnutrition and Abnormalities of the Lens

Cataracts have been shown to develop in the eyes of rats maintained on diets deficient in the amino acids tryptophane or histidine.[13] It has also been shown by Schaeffer and Geiger[13] that the ability of tryptophane to prevent cataract development in the rat's eye is evident only when this amino acid is supplied simultaneously with all of the other amino acids essential for the rat. However, I know of no evidence that malnutrition may be responsible for cataract formation in man, in the absence of such gross metabolic and degenerative disorders as diabetes mellitus, arteriosclerosis and the rare condition of galactosemia.[14] Galactose is toxic for lens tissue and, as it is normally converted to glucose in the liver, it is possible that galactosemia with resultant cataract formation may appear in some individuals with impaired liver function who habitually consume substantial quantities of milk. Galactose and

glucose appear to be mutually antagonistic and readily available glucose is essential for the health of the optic lens.

Malnutrition and Abnormalities of the Cornea and Conjunctiva

That disturbances of the cornea and conjunctiva may occur in association with nutritional deficiency has long been recognized. In the early descriptions of pellagra, inflammation of the cornea and corneal opacities were mentioned and epithelial changes due to vitamin A deficiency are reported to be a common cause of blindness in the Orient.

According to Clements,[15] in infants with vitamin A deficiency there is a loss or standstill in weight for some time preceding the development of eye lesions. The eyelids are frequently swollen and infected, with a copious sticky discharge, early in the disease. The first change in the bulbar epithelium is irregular dryness and loss of luster (xerophthalmia), due to keratinization, followed by the development of Bitot's spots. Further progression of the disease may be manifested by increasing haziness, softness and even ulceration of the cornea (keratomalacia). The cornea appears to decrease in vulnerability with advancing age or it may be due to the fact that severe, acute vitamin A deficiency occurs only in infants but, in any event, keratomalacia is common in infants with severe vitamin A deficiency and is rare among adults. About one quarter of infants with keratomalacia who survive are permanently and totally blind and perhaps another 25 per cent have greatly impaired vision.

Although severe, acute vitamin A deficiency and keratomalacia are uncommon in this country, milder forms of xerosis of the conjunctiva, often with mild xerosis corneae, appear to be prevalent.[16, 17, 18] Whether or not all such changes detected on gross examination or by means of the biomicroscope are the result of previous or present chronic vitamin A deficiency is still a moot point. Some of the differences in interpretation arise from the fact that xerosis of the conjunctiva increases in incidence with advancing age groups so commonly as to be generally regarded as a normal aging process. However, the same observation supports the idea that these changes are the result of low grade chronic or intermittent vitamin A deficiency. Also, and quite frequently, one will observe such so-called senile changes in quite young persons and note their

absence in many of the elderly. When xerosis conjunctivae is observed in an individual or a group, other evidences of vitamin A deficiency, as well as of other vitamin deficiencies, should be looked for and corrective measures instituted.

The response of chronic xerosis conjunctivae to vitamin A therapy is slow. Kruse[16] states that it is a matter of months, even with therapy of high potency, and I have observed patients who have received 100,000 I.U. of vitamin A daily for as long as two years without any demonstrable change in their conjunctivae. I know no way of telling beforehand which persons will respond fairly rapidly to therapy and which will not.

Vascularization of the cornea, with or without opacities has been described in the experimental animal maintained on diets deficient in vitamin A,[19] in riboflavin,[19, 20] in protein,[21] in methionine,[22] in tryptophane,[23] in other amino acids,[24] in zinc and in sodium.[25] In man corneal vascularization has been observed to result from riboflavin deficiency and to respond to riboflavin therapy.[26, 27, 28] Although riboflavin deficiency is the only nutritional deficiency that definitely has been found to be associated with vascularization of the cornea in man, it seems certain that in man, as well as in the experimental animal, many other nutritional factors as well as traumatic agents frequently act as primary or major contributory causes. Practically all clinicians who have had experience with the treatment of corneal vascularization with riboflavin have observed the high prevalence of this condition and the frequent failure to respond to riboflavin therapy,[29] even with prolonged treatment.

The importance of trauma in the production or exacerbation of the vascularization, through excessive exposure to cold, wind and strong light and excessive use of the eyes for reading and fine work, has been emphasized repeatedly. It is pertinent to point out in this connection that the well-nourished and healthy cornea is highly resistant to such traumatic factors. Some investigators maintain that vascularization of the cornea does not result from the type of trauma mentioned unless malnutrition of the cornea exists. Under favorable conditions, the vessels in a presently or previously malnourished cornea may be collapsed and devoid of blood, only to become engorged with blood on the stimulus of external trauma. Severe snow blindness is common among Indians of the Hudson

Bay area who subsist principally on the foods they can obtain from the trading posts rather than off the land as their forefathers were accustomed to do.[30]

Patients with rosacea keratitis, with or without acne rosacea, have been treated effectively with oral or parenterally administered riboflavin by Johnson and his co-workers at Western Reserve University School of Medicine.[31, 32] He found that riboflavin therapy appeared to be of no value in conditions accompanied by large blood vessels or in other injuries in which scar tissue is present.[31] He places emphasis on the desirability of continuous therapy "for constant benefit."

The major ocular symptoms of ariboflavinosis are photophobia and dimness of vision not corrected by adjustment of refractive errors. Burning sensations of the eyeballs, "roughness" of the eyelids and extreme visual fatigue are very common. The earliest and most common sign is circumcorneal injection, followed by the progressive extension of capillary loops into the cornea.

Before leaving the subject of the cornea, I bring to your attention, as possibly worthy of further investigation, the work of Simon Stone on the treatment of interstitial keratitis with vitamin E[33] and the finding of Knapp that some cases of keratoconus respond to vitamin D therapy.[34] Dr. Stone suggests that vitamin E combined with the B complex may be a most valuable adjunct in the treatment of interstitial keratitis. He found it to hasten the absorption of corneal exudates and opacities, to prevent further organization of scar tissues of the cornea and to reduce excessive capillary permeability.

Malnutrition and the Optic Nerve

Visual disturbances ranging from blurring of vision to complete blindness have been the subject of numerous reports on prisoners of war incarcerated in Japanese prison camps during the recent war.[35, 36, 37, 38] Although the reports from different camps differ from each other in a number of details, the general picture is much the same; the gradual development of complaints referable to the eyes and dimness of vision with the eventual development of central scotomata and optic atrophy on diets strikingly deficient in the B vitamins and associated with the syndrome of "burning feet,"

peripheral neuritis, beriberi and pellagra. Because of the conditions under which medical work had to be done in these camps it was not possible for the physicians treating cases to determine the exact etiology of the visual defects observed. But, it seems certain that the retrobulbar neuritis and optic atrophy were the result of nutritional deficiencies and particularly of a deficiency of the B vitamins. Evidence from other sources tends to confirm the implication that a deficiency of certain of the B vitamins is the principal etiological factor.

Retrobulbar neuritis, scotomata, oculomotor palsies and diminished corneal and conjunctival sensitivity have been encountered with varying frequency in Oriental beriberi.[39] Dimness of vision associated with impaired hearing, pellagra, clinical ariboflavinosis and peripheral neuritis has been reported from West Africa and among both children and adults in Jamaica, B.W.I.[40, 41] Whitbourne, working in Jamaica, found therapy with brewers yeast to be effective although vision sometimes failed to improve in long-standing cases.[40] In a very interesting piece of work carried on in New York City, Carroll[42] found that patients with tobacco-alcohol amblyopia improved or completely recovered when treated with vitamin B complex, even though they continued to consume their customary amounts of alcohol and tobacco throughout the period of treatment. Five patients treated only with synthetic thiamine showed improvement, one demonstrating complete recovery.

Carroll's explanation of tobacco-alcohol amblyopia is that it is the result of a "toxic action of tobacco and alcohol on malnourished cells" and he recommends treatment with therapeutic amounts of the whole B complex along with withdrawal of the toxic agent. It seems likely that this condition is closely related to, if not identical with, the retrobulbar neuritis observed in West Africa, Jamaica, among prisoners in Japanese prisoner of war camps and in association with Oriental beriberi.

Malnutrition and the Extraocular Muscles

Nystagmus and varying ophthalmoplegias have been observed in association with chronic alcoholism, gastrointestinal lesions, persistent vomiting, pernicious anemia, persistent anorexia and cachexia, scurvy, beriberi, pellagra and among prisoners of war in

Japanese prison camps. The ophthalmoplegias may or may not be associated with clouding of consciousness, ataxia and other evidences of central nervous system involvement but some degree of peripheral neuritis is a pretty constant concomitant.[43] The basic pathology of Wernicke's syndrome consists of small foci of degeneration, varicose deformities of the blood vessels and petechial hemorrhages in the periventricular gray matter and the cerebral cortex. The nuclei of the third, fourth and sixth cranial nerves are characteristically involved. More than one nutritional deficiency is involved in the production of the complete Wernicke's syndrome but thiamine deficiency appears to be the cause of the ophthalmoplegias and thiamine is curative of them.[43]

Malnutrition and Other Visual Disturbances

It is not possible in the space allotted me to go into detail regarding all of the visual disturbances which are associated with malnutrition. It is clear that degenerative diseases of the vascular system and metabolic disorders which affect the supply of nutritional substances to the eye and to the central nervous system can have a deleterious effect upon vision as do those vascular conditions responsible for destruction of the substance of the visual mechanism. In old age and in other conditions of impaired circulation or metabolism particular attention to the adequacy of the intake of essential nutrients is necessary to ensure the best possible nutritional environment for vital organs.

I am sure also that you are aware of the mass of experimental evidence indicating the relation between the nutritional status of the animal and the age of onset of senescence. If we are to accomplish anything by our efforts to prolong the prime of life, and this is particularly important to industry, the establishment of an adequate nutritional environment for the individual should be accomplished early in his life and he should be maintained in the best possible nutritional status throughout his life span.

Central nervous system fatigue is the most common and most important type of fatigue encountered in modern industry.[44] Recent work indicates that disturbances of the eye and of vision may be the earliest detectable objective signs of such fatigue. The fusion frequency of flicker, defined as that frequency at which a series of

successive light flashes produces the sensation of plain light instead of flicker, has been suggested for measurement of central nervous system fatigue.[45] Simonson, *et al.*,[46] working with 23 healthy subjects, found that although surplus vitamin B complex had no effect on the capacity for muscular work it did increase the fusion frequency of flicker and produced a subjective improvement of working capacity. The measurement of pupillary movements[47] also promises to be a useful early means of detecting fatigue. With the perfection of these and similar methods for the objective measurement of central nervous system fatigue, we will be, for the first time, in a position to make practical studies in industry on fatigue and the relation of nutritional status to resistance to and recovery from fatigue.

Impairment of peripheral vision is another form of visual defect which may be encountered under certain circumstances in industry. This phenomenon has been observed in aviators and other individuals exposed to the oxygen tension normally encountered at altitudes of 10,000 feet and above[48, 49] and is associated with anoxia of the cerebral cortex. King, *et al.*[48] found that a gain in altitude tolerance was afforded by pre-flight and in-flight meals high in carbohydrate. Whether disturbances in peripheral vision may occur as the result of chronic deficiency of one or more members of the vitamin B complex with resultant disturbance of carbohydrate metabolism in the central nervous system deserves intensive investigation.

Conclusion

Nutritional deficiencies affect vision directly and indirectly, through their action upon the eye and their effects upon the central nervous system and the organism as a whole. They should be the concern of the ophthalmologist to as great an extent as of the practitioner in any other branch of medicine. Although not too much is known of the effects of mild and chronic deficiencies on vision, it is not improbable that the eye will prove to be one of the best indicators of the presence and importance of such deficiencies. Vision and the eye appear to be an excellent mechanism by which to measure central nervous system fatigue, one of the most important human engineering problems facing modern industry. Due

to the progressively increasing average age of industrial workers, the nutrition of the workers should be a matter of major concern to industrialists and to the country, as our major hope for prolonging the prime of life and the usefulness of all of us lies in our ability to improve our nutritional status.

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Getting Agencies to Work Together for Sight Conservation*

Marcella C. Goldberg

PRACTICAL examples of how community agencies work together, not only for the welfare of their charges, but for their own professional growth.

THERE are many lessons, good and bad, that we can learn from our attempts, amateur as they may be, to participate in political ventures—even though we dignify them by calling them legislative activities. One of these lessons is the value of the "give and take" policy that is so common in legislative processes. It can, of course, be applied for good or for evil—the decision depending probably on which side of the fence one is sitting at the given moment. This give and take policy is also applicable to getting agencies to work together—we cannot and must not expect that they will take all of our theories and ideas on the importance of conserving vision without expecting us to take on some of their theories on education, child care, recreational needs of the aged, and countless other equally dynamic programs.

We function as an agency in the community, and therefore we must function as a part of the community. This means, difficult as it may seem at times, sitting on committees and participating in seemingly extracurricular activities until we wonder whether we will ever have enough time to devote to our own function. The thing we must recognize is the value of this participation in indirectly furthering our own aims of prevention of blindness. Sometimes it seems more concrete to go out and do something for Mrs. Jones yourself, but in the long run, many Mrs. Joneses will benefit

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if you are able to interest and inform others of the one Mrs. Jones' needs, so that they will help not only her but others who may have the same or a similar problem.

Specifically this is applicable to the ways in which we are able to get agencies to work together with us to conserve vision. There are many ways to do this: participation in community planning is one; others are by educational methods, by demonstration case-work methods, and by cooperative case work.

Cooperative Case Work

Cooperative case work is perhaps the best illustration of agencies' working together to achieve a common goal and to benefit mutually through an indirect educational process.

The glaucoma control clinic, sponsored jointly by our agency and by the Eye Staff of the Pittsburgh Eye and Ear Hospital, demonstrates in many ways the types of agencies which can be brought into the picture, the numbers of professional persons who are exposed to the educational aspects of glaucoma—all in the co-operative effort to help a particular patient to meet his problems in the way which will least upset his emotional balance.

Mr. L is a glaucoma patient living alone on a minimum subsistence grant from the Old Age Assistance Division of the Department of Public Assistance. He cannot, on his grant, budget the recommended foods for his diet. Previously a special diet as recommended by the doctor had been set up by the nutritional consultant of the Public Health Nursing Association, and the cost was estimated at current market prices. The medical social worker interpreted the patient's needs to the Department of Public Assistance visitor, requesting a reevaluation of the food allowance in consideration of this special diet. The following letter dated March 10, 1948, shows what this planning will mean to Mr. L.:

"Your agency's recommendation for a glaucoma diet for Mr. L has been received and acted upon. Effective March 18, 1948, Mr. L will receive a monthly food allowance of $34.52 per month, which is $14.52 over the basic allowance, for a period of six months.

"We shall review his need on August 1, 1948, at which time we shall appreciate a medical report and new recommendation, if necessary."

This indicates a 72 per cent increase in food allowance for Mr. L and he will now need the help of a nutritionist so that he will spend this additional money to best advantage for his food needs.

Mrs. C is in the hospital, having recently undergone surgery for glaucoma. During her stay at the hospital, her daughter with whom she lives was admitted to another hospital in the city and was delivered, by Cesarean section, of her second baby. The three generations—grandmother with glaucoma, mother with major abdominal surgery, and baby facing a new world—are all ready to be sent home at once, to be met and cared for by a young father struggling to get his delayed education under the G.I. bill. Discharge plans have to be worked through with them, for they cannot afford to have adequate help in the home to meet all their varying needs. The medical social worker from the glaucoma clinic meets with the father and with the liaison public health nurse from the obstetrical ward of the hospital, discusses needs and available facilities, in light of the resources known to the patients, and works out plans for returning these patients to their own home. Housekeeping service of the family agency will have to be used for help, so still another agency will enter the picture and be part of the team to help this little family to reestablish itself.

One of the most interesting outgrowths of this clinic is the recognition and appreciation by the ophthalmologists of the benefits of the cooperative services. This is evidenced in their increasing referrals of both clinic and private glaucoma patients for the help which is being demonstrated in this special clinic.

Education in Working Together

Another means of getting agencies to work together is accomplished through direct education methods. This year, the University of Pittsburgh School of Nursing has its first group of graduate nurses studying under federal sponsorship for their master's degrees in psychiatric nursing. These carefully selected, mature women with broad nursing backgrounds will, for the most part, go out as psychiatric nursing consultants to teaching institutions, to public health nursing agencies, and to state health programs. We are serving as part of a block field work experience program, giving a twelve-hour observation period to each nurse. The intent of the

school is to expose these students to a program for the prevention of blindness as well as to give them some understanding of the meaning of eye illness, of visual handicaps, and of the fears of ultimate blindness. They are also getting some insight into the case-work processes with newly blinded persons and with the parents of preschool blind children. Certainly in their areas of specialization, an awareness of eye problems and of the meaning of these problems to the patient can go a long way toward helping to further the prevention of needless blindness.

Eye Problems Explain Family's Social Maladjustments

Another illustration of the values of getting agencies to work together is a case record I had the opportunity to review recently in which the Veteran's Hospital called for some assistance for a young man who had a nonservice-connected eye disability. The ramifications of the situation are too complicated to describe in detail here, but suffice it to say that our agency was originally called in 1936 by a school nurse who referred a young girl, the sister of this boy, whom she suspected to be in need of sight conservation work. Our clearing with the social service exchange showed that the personnel department of a large industry had registered on the family; a Blind Pension registered on the mother; Juvenile Court on two children; and the Department of Public Assistance registered as giving Aid to Dependent Children. Each agency had an active interest in the family; some of them had been together so that the responsibility for financial aid was established, but they had never all sat down together to discuss their various responsibilities or plans for case-work procedure. It was sad but enlightening that when we did get together, everyone was aware that the mother was blind and that at least two of the children were suspected of having marked visual handicaps, but no one had ever thought in terms of having the children examined to discover whether at least part of their problems might not be based on visual disabilities and their fears of following the mother to total blindness. Examinations revealed that four of the five children had serious uncorrected refractive errors combined with some macular degeneration, and that one of the boys (later to be the veteran) had an irritable blind eye which had to be enucleated.

As the real seriousness of the eye problems became evident, each worker began to see the implications of the eye illnesses in the behavior pattern of the individuals and of the family as a whole, and the situation moved toward a clearer goal. Decidedly the members of the family benefited by this process—but even more so did the workers from the various interested agencies, for they were aware not only of the possibilities of conservation of vision, but of the values of combining efforts for a better integrated community program.

The points that these illustrations make are simple evidence of the known fact that we can all get further by working together than we can alone. This pertains not only to the improvement of the community as a whole—an aim in which we are all interested—but also in improving our particular specialties and interests.

An explanation of a sight conservation program for one visually handicapped child to his school nurse and four teachers led to an invitation to talk to a teachers' meeting where the faculty of one hundred were present and were made aware of the possibilities of conservation of vision. The children in the school were undoubtedly the recipients (for a while at least) of the values of their teachers' becoming "eye conscious"—but specifically one teacher's mother went back to her doctor for treatment for glaucoma, and two teachers reported that they would now consent to having aged blind parents follow their doctor's recommendation for cataract extraction!

We function in a community primarily for the end result of preventing unnecessary blindness. In order to accomplish our aim, we must work with other existing agencies for the common good, for in so doing we are educated to other needs, and in turn educate others to help to disseminate our information. We can only function adequately as long as we function as part of the community, working with and through other organized resources—be they health agencies, welfare agencies, schools, or just plain "organizations" of men and women.

What Causes Blindness in Children?*

C. Edith Kerby

EYE conditions among pupils in schools for the blind in the United States, 1945–46.

THE Committee on Statistics of the Blind was organized in 1930 by the American Foundation for the Blind and the National Society for the Prevention of Blindness. The need for such a committee stemmed from the facts that there had been no adequate statistics on causes of blindness in the United States or in foreign countries, and that an accurate census of the blind was not available. To be sure, the United States Bureau of the Census has compiled causes of blindness statistics periodically; but the Census figures were incomplete, and the causes of blindness data were based upon statements made by the blind themselves rather than upon medical records.

Shortly following its appointment, the Committee drafted a plan of classification of causes which met two important needs: (1) to provide comparable data on causes of blindness and (2) to produce data which would give the etiological information needed to formulate prevention of blindness programs.

Since the acceptance of this classification as the standard method of compiling data on causes of blindness in the United States and Canada, the Committee on Statistics of the Blind has made a series of studies of the school age groups. The Social Security Board has issued a bulletin giving data on adults receiving aid to the needy blind in 20 states. The Canadian National Institute for the Blind has compiled data on blind persons of all ages on its register. Other agencies, states, and foreign countries are considering its use.

* A report for the Committee on Statistics of the Blind.

As this is the first time the National Society for the Prevention of Blindness is publishing a study based on the Committee's classification of causes in its own journal, the Society takes this opportunity to express its appreciation to those who are contributing to the success of the project. The group is much too numerous to mention each by name. It includes ophthalmologists who advised the Committee in the early stages of the development of the classification; those who serve as examiners or consultants to the schools and other agencies for the blind who are included in the studies; as well as the superintendents of the schools, the executives of agencies and other staff members of cooperating groups.

In assembling the data on eye conditions among pupils in schools for the blind for the year 1945–46, the Committee on Statistics of the Blind has followed the classifications developed by the Committee as a standard pattern for use in studies of causes of blindness.* Such reports have been issued almost annually since 1933–34, with the number of school units included showing an increase until more than 75 per cent of the braille students in the United States were covered. However, during the war years the schools experienced difficulty in obtaining the ophthalmological service required for production of the eye examination records of pupils upon which the studies are based. The report for 1945–46 therefore covers only 3,689 pupils in the 36 residential schools and 11 city school systems listed in Table I. The group includes sample cases from 34 states and the District of Columbia, but coverage is approximately complete for only 30 states. It is estimated that 68 per cent of all the braille students in the United States are included in this report.

Educational Facilities for the Partially Seeing

Although the primary purpose of the study is to obtain data on causes of blindness as a background for the program of prevention of blindness in children, other facts of interest are brought out (See Tables III and IV). For example, 8 per cent of the pupils receiving braille instruction have better than 20/200 vision. In Ala-

* For copy of the record form for use in the eye examination of blind persons and for detailed instructions for making studies of causes of blindness according to the Committee's plan, see *Manual on the Use of the Standard Classification of Causes of Blindness*, prepared and published by the Committee on Statistics of the Blind.

bama, Arkansas, California, Colorado, Florida, Illinois, Maryland, Michigan, Oklahoma, Perkins (New England), Washington and Wisconsin the percentage is above this average. This does not represent the pupils in the sight-saving classes established in schools for the blind, since the latter group are not included in the study. These partially seeing pupils, together with many in the borderline group (the 10 per cent with vision of 20/200), who could use their eyes in the process of learning are being educated as blind children. They usually come from rural and small urban communities where no provisions have been made for special education facilities for the visually handicapped who are not blind. In accepting them for enrollment the schools for the blind assume a responsibility which they cannot undertake unless sight-saving class methods and facilities are available. It is felt that the establishment of sight-saving classes in the schools for the blind should not be encouraged, since these schools cannot meet all of the educational, vocational, and psychological needs of the individual pupils they are able to absorb.* Nor can they offer facilities to large numbers of the partially seeing who also require this special type of education.** Instead, state education laws should be amended to provide the special educational materials and specially trained personnel required for an adequate program, as has been done in some states.

Need for Medical and Social Services

Another fact disclosed by this study which is of great interest to the schools and to child health and welfare authorities is that the services related to eye care which are made available to visually handicapped children in the infant, preschool, and school age are quite limited. Many of the schools were unable to participate in this study because of inability to obtain an ophthalmological examination for each of their pupils. In the average school for the blind included in this study each child is given at least one routine ophthalmological examination, usually sometime during his first

* See Hathaway, Winifred: *Education and Health of the Partially Seeing Child.* New York: Columbia University Press, 1947; and Lennon, Elizabeth: The Partially Seeing Child in a School for the Blind. *Outlook for the Blind and The Teachers Forum,* Vol. 42, No. 2.

** It is estimated that the respective prevalence rates are approximately: blind—1 in 4,000 to 5,000 of the general school population; partially seeing—1 in 500 to 1,000 of the general school population.

TABLE I. SCHOOLS AND CLASSES FOR THE BLIND IN THE U. S. A.

Schools Participating in Study, 1945–1946	*Number of Pupils*		
	Total	*Males*	*Females*
Total	3,689	2,053	1,636
Alabama School for the Blind	155	91	64
Alabama School for the Blind, Colored Department	28	12	16
Arkansas School for the Blind	86	53	33
Arkansas School for the Blind, Colored Department	18	7	11
California School for the Blind	142	78	64
Los Angeles Public Schools, Braille Classes (California)	67	44	23
Colorado School for Deaf and Blind	47	34	13
Florida School for the Deaf and the Blind	74	46	28
Florida School for the Colored Deaf and the Blind	38	24	14
Atlanta Public Schools, Braille Classes (Georgia)	5	3	2
Idaho State School for the Deaf and Blind	21	13	8
Illinois School for the Blind*	203	120	83
Chicago Public Schools, Braille Classes (Illinois)	59	34	25
Iowa School for the Blind*	82	47	35
Louisiana State School for Negro Blind	32	21	11
Orleans Parish School Board, Braille Classes (Louisiana)	4	2	2
Maryland School for the Blind	87	46	41
Maryland School for the Blind, Colored Department	24	14	10
Perkins Institution and Massachusetts School for the Blind	266	145	121
Michigan School for the Blind*	154	72	82
Battle Creek Public Schools, Braille Classes (Michigan)	6	3	3
Detroit Public Schools, Braille Classes (Michigan)	42	24	18
Grand Rapids Public Schools, Braille Classes (Michigan)	11	5	6
Jackson Public Schools, Braille Classes (Michigan)	10	5	5
Minnesota Braille and Sight-Saving School*	61	35	26
Missouri School for the Blind	128	70	58
Montana School for the Deaf and Blind	17	12	5
New Jersey Public Schools, Braille Classes	65	31	34
New Mexico School for the Blind	64	44	20
New York Institute for the Education of the Blind	171	80	91
New York State School for the Blind	143	73	70
Lavelle School for the Blind (New York)	36	18	18
North Carolina State School for the Blind and the Deaf, White Department	161	90	71
North Carolina State School for the Blind and the Deaf, Colored Department	102	47	55
Ohio State School for the Blind*	203	118	85
Cleveland Public Schools, Braille Classes (Ohio)	39	22	17
Youngstown Public Schools, Braille Classes (Ohio)	12	5	7
Oklahoma School for the Blind**	103	52	51
Overbrook School for the Blind (Pennsylvania)*	213	117	96
Western Pennsylvania School for the Blind	131	80	51
South Carolina School for the Deaf and the Blind	51	35	16
South Carolina School for the Deaf and the Blind, Colored Department	22	13	9
South Dakota School for the Blind	23	10	13
Utah School for the Blind	33	19	14
Washington State School for the Blind	75	46	29
West Virginia Schools for Deaf and Blind‡	83	48	35
Wisconsin School for the Blind	92	45	47

* Does not include sight-saving class pupils.

** Figures for 1944–45. School closed 1945–46.

‡ White school only.

TABLE I. SCHOOLS AND CLASSES FOR THE BLIND IN THE U. S. A. —*Continued*

Schools Participating One or More Years, which Have Dropped Out

Connecticut School for the Blind
Washington, D. C., Public Schools, Braille Classes
Indiana School for the Blind
Kansas State School for the Blind
Louisiana State School for the Blind, White Department
Mississippi School for the Blind
Piney Woods Country Life School (Mississippi)
Nebraska School for the Blind
Oregon State School for the Blind
Tennessee School for the Blind
Texas School for the Blind
Virginia School for the Blind, White Department
Virginia School for the Blind, Colored Department
West Virginia Schools for Colored Deaf and Blind
Milwaukee Public Schools, Braille Classes (Wisconsin)

Schools That Have Never Participated

Arizona State School for the Deaf and the Blind
Long Beach Public Schools, Braille Classes (California)
Georgia Academy for the Blind
Georgia School for the Colored Blind
Kentucky School for the Blind and School for the Colored Blind
Minneapolis Public Schools, Braille Classes (Minnesota)
St. Cloud Public Schools, Braille Classes (Minnesota)
St. Joseph's School for the Blind (New Jersey)
Buffalo Public Schools, Braille Classes (New York)
New York City Public Schools, Braille Classes (New York)
North Dakota State School for the Blind
Cincinnati Public Schools, Braille Classes (Ohio)
Oklahoma State Institute for Deaf, Blind and Orphan Colored Children
Royer-Greaves School for the Blind (Pennsylvania)
St. Mary's Institute for the Blind (Pennsylvania)
Texas Deaf, Dumb, and Blind Institute for Colored Youths

year at the school. However, incompleteness of the records indicates that the examination frequently does not include sufficiently intensive study of each case to establish the cause. Moreover, many records show evidence that indicated corrective treatment has not been carried out either before or after the child enters school.

These omissions suggest the need of competent case-work service for every blind or partially seeing child—to give guidance and interpretation to the parents, to search facilities to meet each of the child's needs, and to aid the physicians, educators, and others in exchange of information and coordination of their services. Since the staff of a school for the blind does not, with few exceptions, include social service, and since these institutions are not usually in a position to extend services to infants or preschool children or even to children of school age who are not applicants to the school,

it is probable that the case-work service should be centralized in the particular state agency which is best able to coordinate the health, welfare, and educational services required by the visually handicapped child, whether blind or partially seeing.

To be truly effective the program should include procedures for early case finding. It would require broad cooperative planning, since many of the facilities and services required by these children are not now available, and so must be developed.

TABLE III. DISTRIBUTION BY AMOUNT OF VISION REMAINING

Vision Groups	*No. of Pupils*	*Per Cent of Total Pupils*
Total	3,689	100.0
Group 10 (Absolute blindness)	762	20.7
Group 11 (Light perception [and/or projection] only)	688	18.7
Group 12 (Motion perception and form perception up to but not including 5/200)	634	17.2
Group 13 (5/200 up to but not including 10/200)	437	11.8
Group 14 (10/200 up to but not including 20/200)	413	11.2
Group 15 (20/200)	365	9.9
Better than 20/200 with peripheral limitation indicated:		
Group 16 (Peripheral field 20° or less)	7	0.2
Group 17 (Peripheral field greater than 20°)	1	(a)
Group 18 (Peripheral field limitation, amount not known)	5	0.1
Group 20 (Better than 20/200 up to and including 20/70 with no peripheral limitation indicated)	213	5.8
Group 21 (Better than 20/70 with no peripheral limitation indicated)	83	2.2
Group 99 (Vision not reported)	81	2.2

(a) Less than one-tenth of 1 per cent.

In the cross-tabulation of causes of blindness, each case is classified both by site and type of eye affection and by etiology. Since the ophthalmologist is able to determine the nature of the eye condition from his own examination, the data on this are quite accurate, comparatively few cases falling into the "not specified" groupings. This is not true of the figures on etiology, which show a

TABLE II. CAUSES OF BLINDNESS AMONG PUPILS IN SCHOOLS AND DAY CLASSES FOR TH

CAUSES OF BLINDNESS BY ETIOLOGY AND BY SITE AND TYPE OF AFFECTION

	ALL CAUSES BY SITE (TOPOGRAPHY) AND TYPE OF AFFECTION		EYEBALL, IN GENERAL	Hypertension (glaucoma)	Refrac. errors: Myopia (incl. myopic astigmatism)	Refrac. errors: Other refractive errors, specified	Refrac. errors: Refractive errors, not specified	Structural anomalies: Panophthalmitis and endophthalmitis	Structural anomalies: Albinism	Structural anomalies: Anophthalmos (excluding surgical)	Structural anomalies: Megalophthalmos (buphthalmos)	Structural anomalies: Microphthalmos	Structural anomalies: Aniridia	Structural anomalies: Coloboma, any part (excl. surgical)	Structural anomalies: Multiple structural anomalies	Structural anomalies: Other structural anomalies, specified	Structural anomalies: Structural anomalies, not specified	Degen. changes: Disorganized, atrophic, phthisic eyeball	Degen. changes: Other degen. changes, specified	Degen. changes: Degen. changes, not specified	Other affections of the eyeball, spec.	Affections of the eyeball, not spec.	CONJUNCTIVA, MUSCLES, AND OTHER OCULAR ADNEXA (200)	CORNEA	Keratitis, interstitial	Keratitis (keratoconjunc.), phlyctenular	Keratitis, ulcerative	Keratitis, not specified	Pannus	Ulceration and vascularization	Other affections of the cornea, specified	Affections of the cornea, not specified	IRIS AND CILIARY BODY
				110	121	128	129	130	141	142	143	144	145	146	147	148	149	151	158	159	180	190	200		310	320	330	340	350	360	380	390	
ALL CAUSES—BY ETIOLOGY	No.	3689	***	1322	2	117	29	4	39	92	18	302	72	15	32	290	34	23	127	30	16	36	44	1	359	50	7	234	18			19	31	222
	%	***	100.0	35.8	0.1	3.1	0.8	0.1	1.0	2.5	0.5	8.2	1.9	0.4	0.8	7.8	0.9	0.6	3.4	0.8	0.4	1.0	1.2	(a)	9.7	1.4	0.2	6.3	0.5			0.5	0.8	6.0
INFECTIOUS DISEASES		731	19.8	181		1			35			10	2			6	1		75	21	15		15		285	42	3	217	8				15	69
11.0 Diphtheria																																	
12.0 Gonorrhea (excluding O. N.)		5	0.1																						5			4				1	
13.0 Measles		21	0.6	5					1			1							3						5			4				1	4
14.0 Meningitis		58	1.6	23					15				1						3	3	1												5
15.1 Ophthalmia neonatorum—gonorrheal		102	2.8	41					2			1							23	6	2		7		51			48				3	8
15.2 Ophthalmia neonatorum—other types																																	
15.9 Ophthalmia neonatorum—not specified		243	6.6	70					3			4							38	9	10		6		148			142	1			5	18
16.0 Scarlet fever		10	0.3	1															1						1				1				1
17.1 Septicemia—acute		9	0.2																														
17.2 Septicemia—chronic		10	0.3	3					3																								3
17.9 Septicemia—not specified		2	0.1																														2
18.0 Smallpox		1	(a)	1																1													
19.1 Syphilis—prenatal		141	3.8	15		1			2			4	1			3	1		2		1				46	40		2	3			1	4
19.2 Syphilis—acquired after birth																																	
19.9 Syphilis—not specified		5	0.1																														
20.0 Trachoma		6	0.2	1															1						5			2				3	
21.0 Tuberculosis		10	0.3	1					1																4	1	2		1				4
22.0 Typhoid fever		2	0.1																						1				1				
27.0 Multiple infectious diseases		5	0.1																														2
28.0 Other infectious diseases, specified		31	0.8	6					3							2			1						3			3					1
29.0 Infectious diseases, not specified		70	1.9	14					5							1			3	2	1		2		16	1	1	12	1			1	17
TRAUMA (including chemical burns)		244	6.6	55			1					1				2			16		1	31	3		21			6			15		92
Non-occupational activities																																	
31.0 Birth processes		33	0.9	5			1									1						3											2
32.0 Medical and surgical procedures		10	0.3	3								1										1	1		3			1			2		
33.0 Play or sport		135	3.7	30															10			19	1		10			3			7		74
34.0 Household activities		5	0.1	2															1			1											2
35.0 Traffic and transportation		23	0.6	4												1			1		1	1											1
38.0 Other non-occupational activities, specified		5	0.1																						1			1					2
39.0 Non-occupational activities, not specified		30	0.8	9															4			4	1		6			1			5		11
40.0 Occupational activities		1	(a)	1																		1											
49.0 Activities, not specified		2	0.1	1																		1			1						1		
POISONINGS		6	0.2																														
51.0 Non-occupational activities		5	0.1																														
52.0 Occupational activities																																	
59.0 Activities, not specified		1	(a)																														
NEOPLASMS (all types) (69.0)		135	3.7	17																3		1	13										2
GENERAL DISEASES (not elsewhere classified)		50	1.4	1											1										4		1	1			2		2
71.0 Anemia and other blood diseases		1	(a)																						1								
72.0 Diabetes		1	(a)																									1					
73.0 Nephritis and other kidney diseases		3	0.1																														1
74.0 Vascular diseases		3	0.1																														
75.0 Diseases of the central nervous system		30	0.8	1											1																		
76.0 Diseases of pregnancy and childbirth																																	
77.0 Nutritional deficiency		3	0.1																						2						2		
78.0 Other general diseases, specified		6	0.2																														1
79.0 General diseases, not specified		3	0.1																						1		1						
PRENATAL ORIGIN (not elsewhere classified)		2141	58.1	987		86	23	2	1	92	18	291	70	15	32	281	33	23	14	2			4		11			1	1			1	8	12
81.0 Hereditary origin, established		116	3.1	40		8				4		4		2	1	18	2	1							1							1	
82.0 Hereditary origin, presumed		435	11.8	182		21	10			39	2	25	11	5		46	10	8	4				1										
89.0 Prenatal origin, cause not specified		1590	43.1	765		57	13	2	1	49	16	262	59	8	31	217	21	14	10	2			3		10			1	1			8	12
ETIOLOGY UNDETERMINED OR NOT SPECIFIED		382	10.3	81	2	30	5	2	3										22	4		4	9	1	38	8	3	9	9			1	8	45
91.0 Unknown to science		51	1.4	39	2	30	5	2																									
92.0 Undetermined by physician		300	8.1	39					3										22	3		4	7	1	37	8	3	9	9			1	7	44
99.0 Not specified		31	0.8	3																1			2		1							1	
					110	121	128	129	130	141	142	143	144	145	146	147	148	149	151	158	159	180	190	200		310	320	330	340	350	360	380	390	

(a) Less than one-tenth of one percent.

* Prepared by the Committee on Statistics of

Affections of the cornea, not specified	IRIS AND CILIARY BODY	Iritis	Iridocyclitis and uveitis	Kerato-iritis	Sympathetic ophthalmitis	Other affections of iris and ciliary, spec.	Affections of iris and ciliary, not spec.	CRYSTALLINE LENS	Cataract	Dislocated lens	Retrolental Fibroplasia	Affections of the lens, not specified	CHOROID AND RETINA	Choroiditis	Retinitis	Chorioretinitis	Detached retina	Retinal hemorrhage	Retinal degeneration (incl. pigmentosa)	Arteriosclerotic dis. of choroid and retina	Other affections of choroid and retina, spec.	Affections of choroid and retina, not spec.	OPTIC NERVE, VISUAL PATHWAY, AND CORTICAL VISUAL CENTERS	Optic nerve atrophy	Optic neuritis (papillitis)	Papilledema (choked disc)	Neuroretinitis	Retrobulbar and intra-cranial lesions	Other affections of the optic nerve, spec.	Affections of the optic nerve, not spec.	VITREOUS (EXCLUDING SEQUELLAE OF KNOWN OCULAR DISEASE) (600)	MISCELLANEOUS AND ILL-DEFINED	Amblyopia, undefined	Other misc. and ill-defined lesions, spec.	Lesions, not specified	
390		410	420	430	440	480	490		510	520	580	590		610	620	630	640	650	660	670	680	690		710	720	730	740	750	780	790	800		910	980	990	
31	222	9	85	34	93	1		596	545	36	14	1	431	54	55	137	21	10	116		36	2	592	406	9	1	33	142	1		3	163	95	6	62	
0.8	6.0	0.2	2.3	0.9	2.5	(a)		16.1	14.8	1.0	0.4	(a)	11.7	1.5	1.5	3.7	0.6	0.3	3.1		0.9	0.1	16.0	11.0	0.2	(a)	0.9	3.8	(a)		0.1	4.4	2.6	0.2	1.7	
15	69	4	36	29				9	9				60	14	5	33	1	1	5		1		102	81	1	1	6	13				25	3		22	
																																			11.0
1																																			12.0
1	4		2	2				3	3				4	1	1	2																			13.0
	5		5										5	2		1	1		1				22	18				4			3	1		2	14.0
3	8		1	7																											2			2	15.1
																																			15.2
5	18			18																											7			7	15.9
	1		1										2	1		1							4	2			1	1			1			1	16.0
																							8	3	1			4			1			1	17.1
	3		3										2			2							2	2											17.2
	2		2																																17.9
																																			18.0
1	4		4					6	6				21	5	4	10			2				43	40			3				6	1		5	19.1
																																			19.2
																							4	4							1			1	19.9
3																																			20.0
	4	1	3																				1	1											21.0
																							1	1											22.0
	2		2																				1					1			1	1			27.0
	1			1									10	2		5		1	2				9	7		1		1			2			2	28.0
1	17	3	13	1									15	3		11					1		7	3			2	2			1			1	29.0
	92		3		88	1		5	5				14		1	4	7	1			1		51	31	2		1	17		1	5	1	1	3	
	2		1		1			1	1				5		1	2	1	1					17	11			1	5			3	1		2	31.0
																							4	3				1							32.0
	74		1		73			2	2				6			2	3				1		10	5	1			4		1	2		1	1	33.0
	2				2																		1					1							34.0
	1				1								3				3						15	9				6							35.0
	2		1		1			1	1														1	1											38.0
	11				10	1		1	1														3	2	1										39.0
																																			40.0
																																			49.0
								1	1														5	3			1	1							
								1	1														4	3			1								51.0
																																			52.0
																							1					1							59.0
	2				2								29								29		87	2				84	1						69.0
	2		2					3	3				9	2	1	3		2			1		28	7	3			18			3	3			
																																			71.0
																							1	1											72.0
	1		1										2			1	1																		73.0
													2					1			1		1	1											74.0
								2	2				2	2									22	1	3			18			3	3			75.0
																																			76.0
																							1	1											77.0
	1		1					1	1				2			2							2	2											78.0
													1					1					1												79.0
8	12	1	10	1				571	522	34	14	1	236	30	37	62	4	2	95		4	2	223	199	2		16	6		1	100	84	4	12	
								58	51	1			10			3	1		4		1	1	5	5							2	2			81.0
								99	85	14			80	3	12	16	1		48				55	46	1		7	1			19	14	2	3	82.0
8	12	1	10	1				414	380	19	14	1	146	27	25	43	2	2	43		3	1	163	148	1		9	5		1	79	68	2	9	89.0
8	45	4	34	4	3			7	5	2			83	8	11	35	9	4	16				96	83	1		9	3		1	30	4	1	25	
													10						10												2	2			91.0
7	44	4	34	4	2			6	4	2			73	8	11	35	9	4	6				96	83	1		9	3		1	3	1	1	1	92.0
1	1				1			1	1																						25	1		24	99.0
390		410	420	430	440	480	490		510	520	580	590		610	620	630	640	650	660	670	680	690		710	720	730	740	750	780	790	800		910	980	990	

...ics on Statistics of the Blind.

TABLE IV. CHILDREN WHO ARE NOT BLIND IN SCHOOLS FOR BLIND
1945–46

Name of School	*Enrollment*	*Partially-Seeing**	*Moderate Defect***
Total: Number	3,689	213	83
Per cent	100	5.8	2.2
Alabama School for the Blind	155	18	18
Alabama School for the Blind, Colored Department	28	..	2
Arkansas School for the Blind	86	16	1
Arkansas School for the Blind, Colored Department	18	2	..
California School for the Blind	142	10	3
Los Angeles Public Schools, Braille Classes (Cal.)	67	1	2
Colorado School for Deaf and Blind	47	9	4
Florida School for the Deaf and the Blind	74	10	1
Florida School for the Colored Deaf and the Blind	38	1	..
Atlanta Public Schools, Braille Classes (Georgia)	5	..	..
Idaho State School for the Deaf and Blind	21	..	3
Illinois School for the Blind[a]	203	16	2
Chicago Public Schools, Braille Classes (Illinois)	59	2	..
Iowa School for the Blind[a]	82	4	1
Louisiana State School for Negro Blind	32	1	2
Orleans Parish School Board, Braille Classes (La.)	4	..	..
Maryland School for the Blind	87	9	3
Maryland School for the Blind, Colored Dept.	24	2	1
Perkins Institution and Massachusetts School for the Blind	266	20	4
Michigan School for the Blind[a]	154	27	6
Battle Creek Public Schools, Braille Classes (Mich.)	6	1	..
Detroit Public Schools, Braille Classes (Michigan)	42	..	..
Grand Rapids Public Schools, Braille Classes (Mich.)	11	..	1
Jackson Public Schools, Braille Classes (Michigan)	10	1	..
Minnesota Braille and Sight-Saving School[a]	61	1	1
Missouri School for the Blind	128	6	3
Montana School for the Deaf and Blind	17	..	1
New Jersey Public Schools, Braille Classes	65	1	..
New Mexico School for the Blind	64	4	..
New York Institute for the Education of the Blind	171	2	4
New York State School for the Blind	143	5	..
Lavelle School for the Blind (New York)	36	2	..
North Carolina State School for the Blind and the Deaf, White Department	161	4	..
North Carolina State School for the Blind and the Deaf, Colored Department	102	2	..
Ohio State School for the Blind[a]	203	4	5
Cleveland Public Schools, Braille Classes (Ohio)	39	..	..
Youngstown Public Schools, Braille Classes (Ohio)	12	..	..
Oklahoma School for the Blind[b]	103	5	5
Overbrook School for the Blind (Pennsylvania)[a]	213	3	..
Western Pennsylvania School for the Blind	131	..	..
South Carolina School for the Deaf and the Blind	51	4	..
South Carolina School for the Deaf and the Blind, Colored Department	22	2	..
South Dakota School for the Blind	23	2	..
Utah School for the Blind	33	..	1
Washington State School for the Blind	75	7	2
West Virginia Schools for Deaf and Blind[c]	83	3	2
Wisconsin School for the Blind	92	6	5

* Includes cases with visual acuity better than 20/200 up to and including 20/70 with no peripheral limitation indicated. See Group 20 Table III.

** Includes cases with visual acuity better than 20/70 with no peripheral limitation indicated. See Group 21 Table III.

[a] Does not include sight-saving class pupils.

[b] Figures for 1944–45. School closed 1945–46.

[c] White school only.

large concentration of unknown cases—43 per cent classified as "Prenatal origin, cause not specified" and 10 per cent under "Etiology undetermined or not specified." One reason for this, as has been noted above, lies in the limitation of the information available. The ophthalmologist sees the child alone at the school, usually long after the date of onset of blindness. He does not interview the parent or have on hand all pertinent information regarding health of the child and his family. Such information could be secured from physicians, hospitals, nurses, or others who may have served the child previously, if the ophthalmologist had the assistance of a medical social worker in his investigations.

Need for Research

Another reason for the large number of "unknown cases" is that our knowledge of the causes of blindness which are present at birth is very limited. While study of the history of each might disclose etiology in many of these cases (heredity, syphilis, or German measles during pregnancy of the mother, premature birth of the infant), intensive research studies are needed to discover what other prenatal factors cause blindness. These would not merely increase the accuracy of statistics on causes of blindness, but would provide a better guide to development of methods of treatment and prevention. We must know where the trouble lies before means can be devised for combating it.

With such a large proportion of the total cases in the "unknown" categories, the specific percentages assigned to the known causes have less significance. However, they do give an idea of the relative importance of various causes, as well as an indication of the groups which should be concerned with prevention of these causes.

Public Health Measures in Preventing Blindness

Foremost in the ranks of prevention of blindness workers are the public health authorities. They are of inestimable help in eradicating the infectious diseases which take a large toll of eyes. The figures of the current study, which include many cases of long standing, do not give full credit to the health authorities for the progress they have made to date. For example, Table II shows that over 9 per cent of the total cases were due to ophthalmia

neonatorum, but a separate tabulation of the cases of *new* pupils entering the school in 1945–46 shows that the figure is less than 3 per cent. This reduction becomes even more notable when the 3 per cent is compared with 28 per cent back in 1906–07, the year the campaign against ophthalmia neonatorum was inaugurated. Another success to be credited to health authorities is the fact that

TABLE V. AGE DISTRIBUTION

Age on Last Birthday[1]	*No. of Pupils*	*Per Cent of Total Pupils*
All ages—Total	3,689	100.0
Under 5 years	16	0.4
5 to 9 years	790	21.4
10 to 14 years	1,398	37.9
15 to 19 years	1,245	33.8
20 years and over	236	6.4
Age not reported	4	0.1

[1] As of December 31, 1945.

TABLE VI. AGE AT ONSET OF BLINDNESS

Age Group		*No. of Pupils*		*Per Cent of Total Pupils*
All ages—Total		3,689		100.0
Under 5 years		2,929		79.5
Before birth	1,892		51.3	
During birth to but not including 1 year	654		17.8	
1 year to but not including 5 years	383		10.4	
5 to 9 years		386		10.5
10 to 14 years		175		4.7
15 to 19 years		30		0.8
20 years and over		2		(a)
Age at onset of blindness not reported		83		2.2
Not blind		84		2.3

(a) Less than one-tenth of 1 per cent.

there is practically no blindness from smallpox—an important cause of blindness in countries lacking our public health services.

Two new problems which now face the health officers are: (1) the prevention of German measles in early pregnancy because it causes cataracts and other congenital defects in the offspring; and (2) the

prevention of retrolental fibroplasia, a serious structural anomaly of the eye which seems to occur chiefly in the tiny premature babies who survive the other hazards of premature birth because of special provisions for their care. The figures of our studies do not now reflect the extent of these recently discovered eye hazards, since children known to be affected are of infant and preschool age and therefore not yet enrolled in schools for the blind.

Heredity in Prevention of Blindness

Geneticists and family physicians of affected families form another group contributing to prevention of blindness. It is they who can assemble the necessary family records of the more serious hereditary eye defects and use the data as a basis for advice to prospective parents. Until medical science develops methods for counteracting the effects of hereditary factors, application of nature's laws of genetics constitutes our only defense against hereditary blindness. The present study shows 15 per cent of blindness among children due to this one cause. Moreover the figure is believed to be underestimated. For instance, checking processes used in the study enable us to find and verify blood relationships among persons with identical surnames, but this provides clues only to relationships through the male parent, not the female.

Safety and Health Education in Sight Conservation

Prevention of the 7 per cent of blindness that is due to trauma brings still another group of prevention workers into the field—the safety councils and other agencies which collaborate with them. They provide safety education to parents and children and support such safety measures as legislation regulating use of fireworks and air rifles. In their campaigns they can use to good advantage such facts brought out in these studies as (1) the dangers in play or sport when it involves eye hazards such as sharp or pointed objects or explosives and (2) the importance of prompt ophthalmological care in case of penetrating injury to an eye to avoid blindness in the uninjured eye from sympathetic ophthalmia.

Data in this series of studies can also be used in health education of the public, which is not sufficiently aware of the importance of

maintaining general health as a protection to eyes. However, caution must be taken in using findings of the study for public health education purposes. It must not be assumed that the figures for certain types of eye affections can be used as an indication of the size of the group that might be aided by a specific type of corrective treatment. For example, the corneal transplant operation is employed to restore vision in many cases of blindness involving corneal opacities, but the full 10 per cent of blind children whose blindness is due to affections of the cornea cannot necessarily be aided by this operation. The extent and nature of the degeneration of the cornea, as well as the possible presence of other complications, must be considered for each case before it can be determined whether the operation might be successful. Again, while cataracts can often be operated upon, the 15 per cent of cases in our data include many cases in which the operation is contraindicated or has been tried without success.

The significance of these reports on causes of blindness has occasionally been misconstrued in assuming that they show distribution of *all* blindness by cause, whereas only causes of blindness occurring from the prenatal through the adolescent years are covered. The age group covered is shown in tabulations by present age and age at onset of blindness. (See Tables V and VI.)

Cause Studies Show Trends

The data on causes of blindness among children of school age have been tabulated annually over a period of years sufficient to show trends in prevention of blindness. In Table VII data are presented to show comparisons between 1935–36 and 1945–46. This table covers only those units for which information is available for each of these school years. It shows a net decrease of 233 cases, or 9 per cent. This reduction should, of course, be considered in relation to changes in the size of the population of school age. Figures from the Office of Education show a decrease of 10.5 per cent in the total number of pupils enrolled in public and private schools from the kindergarten through the high school grades, over the period from 1935–36 to 1944–45; figures from the Bureau of the Census show a decrease of 8.6 per cent in the population of school age (5 to 17 years inclusive) from 1936 to 1945. While this might indi-

TABLE VII. CHANGES IN CAUSES OF BLINDNESS, 1935–36 AND 1945–46*

	Number		Net Change	
	1935–36	*1945–46*	*Number*	*Per Cent*
ALL CAUSES—BY ETIOLOGY	2,578	2,345	−233	− 9.1
Infectious Diseases	*725*	*453*	*−272*	*−37.5*
Diphtheria	4	...	− 4	
Gonorrhea (excluding O. N.)	11	1	− 10	
Measles	29	17	− 12	
Meningitis	54	40	− 14	
Ophthalmia neonatorum—gonorrheal	78	59	− 19	
Ophthalmia neonatorum—other types	1	...	− 1	−23.6
Ophthalmia neonatorum—not specified	193	151	− 42	
Scarlet fever	11	3	− 8	
Septicemia—acute	2	4	+ 2	
Septicemia—chronic	2	9	+ 7	
Septicemia—not specified	7	2	− 5	
Smallpox	...	...	...	
Syphilis—prenatal	125	78	− 47	
Syphilis—acquired after birth	...	...	...	−39.8
Syphilis—not specified	6	1	− 5	
Trachoma	18	3	− 15	
Tuberculosis	13	8	− 5	
Typhoid fever	1	...	− 1	
Multiple infectious diseases	...	1	+ 1	
Other infectious diseases, specified	28	20	− 8	
Infectious diseases, not specified	142	56	− 86	
Trauma (including chemical burns)	*230*	*158*	*− 72*	*−31.2*
Non-occupational Activities				
Birth processes	12	23	+ 11	
Medical and surgical procedures	2	6	+ 4	
Play or sport	120	83	− 37	−30.9
Household activities	9	5	− 4	
Traffic and transportation	16	18	+ 2	
Other non-occupational activities, specified	47	3	− 44	
Non-occupational activities, not specified	22	20	− 2	
Occupational activities	1	...	− 1	
Activities, not specified	1	...	− 1	
Poisonings	*2*	*5*	*+ 3*	
Non-occupational activities	2	4	+ 2	
Occupational activities	...	...	...	
Activities, not specified	...	1	+ 1	
Neoplasms (all types)	*67*	*89*	*+ 22*	*+32.8*
General Diseases (not elsewhere classified)	*44*	*29*	*− 15*	
Anemia and other blood diseases	...	1	+ 1	
Diabetes	...	...	...	
Nephritis and other kidney diseases	1	2	+ 1	
Vascular diseases	...	1	+ 1	
Diseases of the central nervous system	20	17	− 3	
Diseases of pregnancy and childbirth	...	...	...	
Nutritional deficiency	...	2	+ 2	
Other general diseases, specified	20	3	− 17	
General diseases, not specified	3	3	...	
Prenatal Origin (not elsewhere classified)	*1,252*	*1,355*	*+103*	*+ 8.2*
Hereditary origin, established	47	72	+ 25	
Hereditary origin, presumed	256	267	+ 11	+11.9
Prenatal origin, cause not specified	949	1,016	+ 67	+ 7.1
Etiology Undetermined or Not Specified	*258*	*256*	*− 2*	
Unknown to science	8	34	+ 26	
Undetermined by physician	196	213	+ 17	
Not specified	54	9	− 45	

* Unit groups included in this table are those for which data are available for both years. Data cover cases in the following states: Ark., Ill., La., Me., Md., Mass., Mich., Minn., Mo., N. H., N. Y., N. C., Ohio, Okla., Pa., R. I., Vt., Wisc.

cate that no progress has been made in reducing the total amount of blindness among children, there *are* large reductions occurring in cases due to infectious diseases and trauma. These are partly offset by increases in other causes, chiefly the cases of prenatal origin. Table VII provides further evidence of the success of public health measures, especially in control of syphilis and ophthalmia neonatorum. This table shows the success of the eye safety campaign.

The study discloses that congenital blindness is our biggest problem at the present time, and for its solution we need facts that can be acquired only through research. In this connection it is important to note that research projects already are under way on two of these causes. One concerns the relationship of German measles and other infectious diseases occurring in pregnancy to congenital defects; this study centered at the University of Kansas Hospitals, Kansas City, Kansas, is sponsored by the American Academy of Pediatrics and the National Society for the Prevention of Blindness. Studies are also being conducted at several medical schools to discover the specific factor or factors that are responsible for retrolental fibroplasia.

Conclusion

This report presents convincing evidence that blindness can be prevented when the methods are known and applied, and that we cannot afford to overlook any opportunity to add to our knowledge or to bring about widespread application of methods which have been proved to be effective. The study has also revealed incidentally the need for additional services to visually handicapped children.

Maintenance of Eye Efficiency in Workers

Leo Price, M.D.

PRESENTS a practical program of eye health and welfare as embodied by a health center maintained by the needle trades in New York City.

WIDESPREAD misconceptions about eyeglasses and their use are prevalent among workers. Many people seem to believe that acquiring a pair of eyeglasses will take care of any problem of defective vision. Few workers realize that defective vision not only may be due to a refractive error easily corrected by a simple pair of lenses, but that pathological conditions can affect the vision. The pathological condition must be treated, in addition to correcting the vision, if good eyesight is to be maintained.

A worker who runs a machine, and whose eyes must follow his work at close range, also has to learn that the prescription for his eyeglasses has to be adjusted to his individual work process in order that he may enjoy comfortable and effective vision.

A survey among the members of the International Ladies' Garment Workers' Union in New York City—the dressmakers and tailors who depend upon their eyesight for their production skills—revealed that many of these workers do not know that their vision should be improved or that the eyeglasses they have selected do not provide their maximum eye needs and comfort.

About 190,000 women and men in the New York City area are engaged in the ladies garment manufacturing trades which produce every article of women's apparel from nightgowns to ski-suits. The needle trades require close concentration upon the work at hand. Piece-work systems induce pressure and often sewing machine operators do not lift their eyes from their work process for long

periods at a stretch. Naturally a great deal of eye fatigue develops during the day and workers feel a deep concern about their eyesight.

The Union Health Center was established to serve as a medical center for the members of the International Ladies' Garment Workers. This Center conducted a survey among the garment workers to ascertain the visual requirements for each manufacturing process in each craft and to find out how well the eyesight of the workers actually on the job was fitted for their tasks. The survey was carried on in the shops during the working day.

Job Analysis

The workers were divided into four broad craft-groups for the appraisal of visual requirements: (1) operators of sewing machines, such as shirrers, button-hole makers, stitchers; (2) hand workers, such as finishers, examiners, drapers, spot cleaners, whose working angle is not limited by the rigidity of the machine; (3) pressers; and (4) cutters.

Many of the machine operators have more than one specific near distance to contend with during the work process, and often they also need correction for distance vision as well. In the job analysis, the following working distances were encountered: (1) the actual operating distance; (2) the needle-threading distance; and (3) intermittent use of varying distances, particularly in the case of machine operators with a supplementary assignment to pick up and deliver bundles of partially finished work to their co-workers. In the appraisal of the workers' eyesight the customary distant vision must also be considered.

Among different individuals a wide spread of inches was encountered between the two near vision working distances. For example, a worker who usually operated a machine with her eyes 15 inches from the material might need to bend within 8 inches of the needle in order to thread it. It was also found that operators are conditioned by the fixed heights of the machines they operate, the tables which hold their materials, the chairs or stools upon which they sit, and the stoutness and length of their torsos. A tall woman might have to bend down to her work; a short woman might have to lean back from her work; a stout woman might have to hold her head

at an unnatural angle, when all three were required to operate identical machines.

It was found there is no set average working distances for operators, but that each individual can decide his working distances by demonstration at a machine. Hand sewers were found to adjust their working distances to their reading distances. Cleaners, examiners, and drapers also work at the same distance at which they read, since they can move the object upon which they are working to suit their convenience.

Pressers come nearest to having a fixed occupational distance—fixed by the length of the area over which they bend. They are seldom required to bend closer than 14 inches, and 18 inches may be considered the usual working distance.

Cutters operate a cutting machine on a table upon which the material to be cut is spread. Their vision must be accurate for the entire area which can be covered by the spread of their arms—anywhere from 10 to 30 inches—since usually if the cutting machine's line is farther than 30 inches away the cutter will walk around the table to cut along his work line with greater ease.

The Testing Instrument

It is almost impossible to secure a suitable instrument for rapid and satisfactory testing of the visual requirements of needle workers, whose work primarily must be done at short distance. Most screening instruments have not been manufactured for the specific purpose of testing the vision for near distance. The screening instruments available on the market today usually require supplementary tests for best results in the near distance field. Of the screening devices available, the Telebinocular, although limited in its usefulness, was considered the most adaptable, simple to operate, and convenient, and it was selected for the Union Health Center's visual survey. However, for near distance work, such as in the garment industry, the following supplementary tests are required:

1. A new near point test to clarify the testing for near point visual acuity and also for near point fusion;
2. Individual Snellen letter charts for each eye which would afford fine gradations (whether eyesight measured 20/20, 20/30, or 20/40);

3. A near depth perception test to supplement the far depth perception test.

During the time the testing was carried out in the garment factories, such supplementary near point visual acuity tests were not available.

Test Standards Set

The following minimum standards were set up for grading the workers' vision:

1. Operators of machines involving close work would be marked unsatisfactory if they registered a failure of near point visual acuity, or less than the equivalent of 20/50 in either eye for distance.
2. Pressers, drapers, cleaners, and hand-sewers would be marked unsatisfactory if they registered a failure of near point visual acuity, or less than the equivalent of 20/40 in either eye for distance.
3. Cutters would be marked unsatisfactory for failure of near point visual acuity or less than the equivalent of 20/30 in either eye for distance, or for a score of zero in depth perception.

A testing team was assembled, consisting of two nurses or technicians, thoroughly trained in performing the tests, and an optical clerk who assisted in obtaining other essential information for the records. Two testing instruments were used which were manned by the nurses or technicians. The use of two instruments working simultaneously in a shop was found to be most efficient in conducting the survey. The three persons functioning as a team could assemble the workers to be surveyed, complete the testing process, and have the workers returned to their tasks with an interruption of only 10 minutes in each worker's manufacturing process, provided no language difficulties were encountered.

The average garment shop employs 35 workers and one such shop could be surveyed in less than half a day, including setting up and dismantling the instruments and the testing area; explaining the purpose of the test to the workers; and making appointments with the eye specialists at the Union Health Center for those workers who obviously needed further examination by an ophthalmologist.

Findings

The vision evaluation at the Union Health Center brought out a number of interesting statistical, medical, and social facts regarding the eye health and welfare of workers.

Some Statistical Findings.—A sample testing (1,704 workers of varying ages) proved that 51 per cent needed some vision correction; an additional 17 per cent had vision adequate for their specific tasks, but needed correction of vision for distance or for some other visual factor. Only 32 per cent of the workers tested had adequate eyesight in accordance with the temporary standards established.

A detailed study was made of one shop with 402 workers who submitted to the testing. Of these, 51 per cent failed; 22 per cent had vision adequate for their tasks but needed some other correction; and 27 per cent met the visual standards suggested. In near point fusion tests by the telebinocular instrument, 70 per cent of workers over 40 years of age failed the available test given. Among the shop workers, 34 per cent did not wear glasses; no information on eyeglass wearing was collected for 4 per cent; and 62 per cent wore eyeglasses. Of these, 24 per cent had previously been seen by an ophthalmologist and 32 per cent by an optometrist. Of those wearing glasses, 60 per cent had purchased their glasses less than three years previously, and 40 per cent had had their present glasses more than three years.

Improper Eyeglasses Harmful.—The fact that such a large proportion of the workers tested need vision correction makes it apparent that even those wearing eyeglasses have not solved their visual problems. Machine operators particularly may be lulled into a false sense of security by obtaining eyeglasses correcting their sight for their reading distances, although these glasses may be wholly inadequate for their working distances. The strain induced by the effort to compensate for the inadequacy of the correction may be manifested by headaches, dizziness, and stiffness of the neck, without realization on the victim's part of the relationship between his eyes and his bodily discomfort.

The understandable desire on the part of workers to see the working area better often leads to their securing overcorrection in

eyeglasses, which ultimately results in ocular fatigue. An individual whose working distance approaches within one inch or two from his reading distance may be overcorrected for one function and undercorrected for the other.

Education on Eye Health Needed.—There seems to be a tendency to purchase eyeglasses without submitting to the precaution of a thorough eye examination to detect and treat pathology and to correct visual defects. The lower cost of spectacles obtained directly from a dispensing shop probably accounts for the tendency.

Education is greatly needed to help the public realize the importance of obtaining professional advice and service for their visual comfort and eye health. Second-quality optical lenses are often sold to eyeglass purchasers at far lower cost than the price of first quality lenses. The science of optics, which employs very minute measurements, must be exact if the eyeglass wearer is to be aided. Inexact optical aids, if worn consistently, may injure the wearer's eyesight. The fact that improperly ground lenses may be dispensed on a low-cost basis makes it desirable for everyone to realize that the protection of his eyesight depends upon the supervision of his visual aids by especially trained and oriented ophthalmologists, optometrists, and opticians. Eyeglasses improperly fitted can be a menace to the health of a worker in trades requiring constant close vision, and a handicap to his production and his livelihood.

The occupational ophthalmologist must integrate the eye problems of the patient with the other medical problems that often accompany visual difficulties. In addition, the eye specialist should become familiar with the visual needs of each industrial craft and adjust the eyeglass prescriptions to the working needs of the patients.

Conclusion

Since the vision test conducted by the Union Health Center showed 68 per cent of the garment workers tested failed to show adequate visual acuity, it is disturbing to realize that much needs to be done in the field of vision correction. The difficulties and obstacles that must be overcome to develop an effective preventive and maintenance eyesight conservation program are augmented by

the universal misunderstandings about eye care. The workers in this industry are deeply concerned with the health of their eyes, yet many of these workers who wear glasses have occupational visual problems. The most essential need is to educate the worker to secure the highest professional service for his visual needs and to disregard low-price material inducements which often merely sell eyeglasses of questionable quality.

Labor's Participation in the Health and Safety Program*

Leslie H. Anderson

DESCRIBES how a labor health institute incorporated eye health and safety into its program.

THE Health Institute was set up in Detroit in 1937, following the organization of the United Automobile and Aircraft Workers' Union, and is supported by a .02½ per capita tax from those locals that affiliate. There is a two dollar ($2.00) registration fee paid by members that come to the Institute for diagnosis. This fee entitles the member to one year's diagnostic service which includes complete laboratory and consultation with specialists maintained on the staff.

The Institute is a pilot operation set up by the UAW in an effort to demonstrate the needs and means of providing better medical service at a moderate rate for union members and their families. The service at this time does not include treatment nor service to a member's family. However, the acceptance and use of the Institute indicate that more inclusive plans for complete medical care through an insurance plan will be readily accepted by union members in the not too distant future. Through a UAW survey of hospital bed requirements made by Dr. Franz Goldman, Yale University, it was decided that Detroit desperately needs more hospital beds.

Dr. I. Donald Fagin, a New York University graduate, is Medical Director of the Institute. For the past five years, he has served in the Army as an instructor in internal medicine. Under his direction, the Health Institute has become recognized as one of the leading

* Presented at the Graduate Course on Occupational Aspects of Ophthalmology of the New York University College of Medicine, New York, N. Y.

diagnostic clinics. All of the twenty-one consulting specialists are members of the Wayne County Medical Society and staff members of Detroit hospitals.

The Health Institute is housed in a beautiful old estate on the Detroit River between Lake St. Clair and Lake Erie. Belle Isle Park is located directly across the river. The grounds and building were formerly the Edsel Ford estate. Stately old trees and shrubs enhance the beauty of the grounds and building.

Two other departments are situated in the Health Institute—social service and health and safety education—supported by a grant from the Detroit Community Chest. The Health Institute is a member of the Council of Social Agencies. The social service department is staffed by two well-qualified and experienced psychiatric social service workers and two consulting psychiatrists who are members of the Wayne County Medical Society. Many of the cases coming to the Health Institute require guidance, and referrals come not only from the medical staff at the Health Institute but also from community agencies in Detroit and the surrounding cities. Union members are learning the value of qualified medical and social service. In the past, because of lack of information and income, they resorted to less acceptable means of obtaining this service. For this reason the Health Institute is considered an educational agency. This is one of its most important contributions to the community. Early diagnosis with referral to qualified physicians in the community and prevention of illness through education constitute the major services at this time.

The department of health and safety education is staffed by an educational director from the field of public health, a graduate engineer formerly with the U.S. Department of Labor, and a field representative from the International UAW. In addition, a health educator was given six months field work with the health education department and she is now employed full time by the Wayne County Tuberculosis Society to work in some of the large locals. Ford local, with 65,000 members in the River Rouge plant, is being served under this plan. Through this department all community agencies are called upon to aid in planning and providing instructors and speakers for the classes and educational periods given over during meetings of the locals. Classes are jointly spon-

sored by the Health Institute and Wayne University and Michigan University. The introduction of health and safety group education to members is a new experience for the union. There has been for many years an extensive educational program in collective bargaining, public speaking, parliamentary procedure, but health and safety education is an endeavor in a less controversial field and is attractive to many of the union members. In the two years that this department has been functioning, many outstanding safety leaders from the labor group have been developed. They are now serving as instructors and speakers in their own locals and providing leadership for safe and healthful working conditions in the factories. Through joint management-labor health and safety committees there have been a few remarkable cases of sharp reduction in accident rates. The acceptance by management of the joint committees is gradually gaining favor because a program of education, responsibility and participation is proving its value not only to union members but to management. Intelligent leadership in health and safety is being developed and democratic participation will aid in reducing the 17,000 workers killed every year in the factories and also the factory accidents that amount to well over two million.

Members of the trained health and safety group are becoming aware of the necessity for an adequate eye health and safety program in the factories. The eye conservation program as set up by the National Society for the Prevention of Blindness was incorporated into the health and safety courses when the classes were started. The Society was asked to provide an exhibit, literature, and an educator at the International UAW Convention in Atlantic City in 1946. Other organizations providing exhibits and education were the U.S. Public Health Service, New Jersey State Department of Health, Bureau of Industrial Hygiene, U.S. Department of Labor, National Tuberculosis Association, and other national health agencies. For the first time unions were having firsthand contact with health agencies. From this has grown an interest in all phases of health.

Eye health programs are now being requested by locals and qualified speakers are being provided through the health education department. Films and exhibits are being shown on the effects

of lighting, color and good housekeeping on the workers' health and well-being. A healthy worker produces better products and the nation benefits. Just as in the case of the Health Institute set up for the diagnosis of industrial diseases, it was found very soon that general health and industrial health are inseparable; this is true in eye safety. Eye health cannot be separated from eye safety or general health. More attention is being given to wearing safety glasses in the factory because the workers, through education, now are willing to wear protective equipment. Workers know that age and disease may cause them to need prescription safety lenses. They are becoming more attentive to their fellow workers and carry on a crusade-like movement in the shop to encourage through tactful suggestion the wearing of safety equipment.

Classes in industrial psychology are provided to the graduate health and safety students. We feel that this will eventually contribute much to a successful and vital program. The plant medical director will find that through this type of education a spirit of cooperation and understanding will be developed, with fewer accidents and deaths.

In summary, the UAW CIO Health Institute is first placing emphasis on education and prevention of accidents and illness. Secondly, this program does not take any of management's responsibility for the healthful and safe working conditions but it does educate the workers to understand and cooperate in maintaining the program.

Note and Comment

Society's 1948 Conference a Success.—Five hundred delegates from 23 states, Washington, D. C., Hawaii, and 15 foreign countries attended the 1948 Conference of the National Society, held in Minneapolis, Minnesota, April 5–7. The Conference was opened with a luncheon at which The Honorable Hubert H. Humphrey, Mayor of the City of Minneapolis, welcomed the delegates to the city. Amos S. Deinard, president of the Minnesota Society for the Prevention of Blindness, spoke on "The Rôle of a Board Member in a Voluntary Health Agency." Dr. A. J. Chesley, secretary and executive officer, Minnesota Department of Health, served as chairman, and the State Commissioners of Education and Welfare extended greetings from their departments.

The Honorable Luther W. Youngdahl, Governor of the state of Minnesota, brought greetings from the state at the Conference dinner, at which Dr. Haven Emerson, member of the Board of Health of New York City and emeritus professor of public health practice, College of Physicians and Surgeons, Columbia University, was the principal speaker. His subject was "Sight Conservation in the Local Health Program." Mason H. Bigelow, the National Society's president, was chairman.

The responsibility of public health workers for eye health was emphasized in discussions of communicable causes of blindness and methods of case-finding and follow-up of children and adults with eye problems. This session was under the chairmanship of Dr. Gaylord W. Anderson, Mayo professor and director, School of Public Health, University of Minnesota.

The development of a community-wide prevention program was outlined by representatives of a number of voluntary prevention of blindness agencies who were able to present practical information based on their own experience. Dr. Donald A. Dukelow, director, Health and Medical Care Division, Minneapolis Council of Social Agencies, Inc., and Community Chest, presided at this session.

Scientific problems of great importance to prevention workers at the present time were discussed by leading ophthalmologists, under

the chairmanship of Dr. William L. Benedict, Head, Section of Ophthalmology, Mayo Clinic.

Other sessions included information about advances in the lighting of school buildings, eye health programs for college students, planning industrial health programs and educational problems of the exceptional child.

Pan-American Congress of Ophthalmology.—The National Society was represented at the recent meeting of the Pan-American Congress of Ophthalmology in Havana, Cuba, by its executive director, Franklin M. Foote, M.D., and its consulting industrial engineer, Charles P. Tolman. One full day of the Congress was devoted to the prevention of blindness, at which the Society's staff members participated. Dr. Foote presented the subject of "Public Responsibility for an Eye Health Program," and Mr. Tolman discussed the industrial aspects of prevention of blindness.

The Congress was the occasion for the presentation by the National Society of a gold medal awarded to Dr. Harry S. Gradle which was accepted for him by Dr. Frederick C. Cordes of San Francisco. The award was made to Dr. Gradle for his untiring and devoted services in prevention of blindness and particularly for his efforts to build up Pan-American relationships.

The International Association for Research in Ophthalmology and Allied Sciences was planned during the Congress, and an organizing committee was appointed consisting of Conrad Berens, M.D., chairman; Brittain F. Payne, M.D.; Dr. Foote; and Mr. Tolman.

The Congress adopted statutes and by-laws and permanent committees have been set up to deal with the encouragement of research, glaucoma, trachoma, lighting and optics, prevention of blindness, neuro-ophthalmology, legal and industrial ophthalmology, and other subjects. Dr. Foote was appointed to the Pan-American Association of Ophthalmology's Committee for the Prevention of Blindness and Mr. Tolman was made a member of the Committee on Techniques of Lighting and Optics.

Summer Courses.—The National Society for the Prevention of Blindness, in calling attention to the shortage of teachers and

supervisors of partially seeing children, suggests that superintendents expecting to open classes or to fill vacancies encourage teachers to prepare for this work by taking advantage of courses being offered during the summer session of 1948.

Because of the large number of partially seeing children in communities too small to establish classes and in rural areas, the Society suggests that elementary school supervisors in these areas take advantage of such courses in order that they may be equipped to give necessary information and assistance to teachers having partially seeing children in their groups.

The following courses are listed according to the dates of the opening of the session:

ELEMENTARY COURSES

Place	*Dates*	*For Details Apply to:*
University of Tampa, Tampa, Florida	June 7–July 16	Dr. M. C. Rhodes, Dean of Administration
University of Tennessee, Knoxville, Tennessee	June 14–July 21	Dr. Florence V. Essery, Associate Professor of Education
Michigan State Normal College, Ypsilanti, Michigan	June 21–July 30	Dr. Francis E. Lord, Director of Special Education, Horace H. Rackham School of Special Education
Ohio State University, Columbus, Ohio	June 22–July 28	Dr. Herschel Nisonger, Director, Bureau of Special Education
San Francisco State College, San Francisco, California	June 28–August 6	Dr. Leo F. Cain, Director of Special Education
University of Wisconsin, Madison, Wisconsin	June 28–August 20	Mr. Kai Jensen, Chairman Committee on Child Development, School of Education

ELEMENTARY COURSES—*Continued*

Place	*Dates*	*For Details Apply to:*
Wayne University, Detroit, Michigan	June 28–August 7	Mr. John W. Tenny, General Adviser, Special Education
Illinois State Normal University, Normal, Illinois	July 5–August 27	Dr. Rose E. Parker, Director, Division of Special Education
Teachers College, Columbia University, New York, N. Y.	July 6–August 13	Dr. William B. Featherstone, Head, Department of Education of the Exceptional
Ball State Teachers College, Muncie, Indiana	July 19–August 20	Registrar
	ADVANCED COURSE	
Florida State University, Tallahassee, Florida	June 14–July 23	Dr. R. L. Eyman, Dean, School of Education

Some of the courses listed above will not have a demonstration sight-saving class. It is advisable, therefore, to obtain full information directly from the college or university.

Workshops for teachers interested in special education will be given at a number of places during the summer session. These will probably devote some time to the education of the partially seeing child.

Some Tips on Giving.—Readers of the REVIEW, most of whom have some interest in privately supported organizations—either as active participants in their programs or as givers—will find a number of pertinent "don'ts" in an article appearing in a recent issue of *'48 The Magazine of the Year*. This article points out that "over $600,000,000 a year is deliberately taken out of your pocket by the world's meanest chiselers—the phony philanthropists.

There are ten ways to avoid confidence men whose pleas are hidden behind false charitable enterprises. They are:

"1. Don't be carried away by your enthusiasm for humanitarian aims;

"2. Don't heed appeals by mail from unknown institutions. In the case of those claiming to perform a local service in some other area, it's well to heed the rule that charity begins at home;

"3. Don't fall for high-pressure telephone solicitations. Insist that the solicitor put his proposition in a letter. That way, he's liable to a mail-fraud charge if the appeal should be phony;

"4. Don't shell out to collectors who come begging for obscure charities. Be especially wary of men and women in religious garb claiming to represent loosely identified church benevolences;

"5. Don't be humbugged by the 'benefit' approach. Before you buy tickets to a baseball game or invest in a car raffle, find out how much of your money goes to a promoter and his aides;

"6. Don't be misled by a deliberate similarity of names. The 'American Volunteer Army' would be neither the 'Salvation Army' nor the 'Volunteers of America';

"7. Don't pay for and don't return unordered merchandise. If you have scruples about using something not paid for, simply throw it in the wastebasket. You're under no obligation, legal or moral, to return the stuff foisted on you;

"8. Don't be dazzled by an imposing list of sponsors. Such lists can be faked;

"9. Don't give indiscriminately to tag days and street-corner collections. Even poppy sales have been abused;

"10. Don't send money, food or clothing to strangers in response to begging letters."

National Society's New Appointments.—In keeping with the recommendations of its recent Plan and Scope Committee to enlarge the Society's staff by the addition of a director of health education, the Society has obtained the services of Doris G. Chandler, M.P.H., who will fill this post. Miss Chandler has for the past few years been executive secretary of the Metropolitan Health Council of Dayton and Montgomery County, Ohio, and has had

broad experience in the fields of health education and community organization.

Helen E. Weaver, R.N., was engaged as consultant in nursing activities by the Society, to succeed Marguerite M. Furey, R.N., who found it necessary to resign early this year. Miss Weaver was formerly consultant public health nurse of the Division of Venereal Disease Control of the New York State Department of Health and served also as staff nurse and later as medical supervisor with the New York Child's Foster Home Service.

On the Society's Board of Directors, Frank H. Woods, Jr. has been elected to take the place of Russell Tyson who submitted his resignation as director and vice-president of the National Society. Other recently elected members of the Society's Board of Directors are: Eugene M. Blake, M.D., professor of clinical ophthalmology, Yale University School of Medicine, New Haven, Connecticut; and Wilton S. Halverson, M. D., director, California State Department of Public Health, San Francisco, California. Dr. Blake has been made a member of the Society's Executive Committee to replace Pauline B. Williamson who has been made one of the Society's vice-presidents.

The REVIEW is also pleased to announce the appointment of Olive S. Peck, Cleveland, Ohio, and Dorothy B. Nyswander, Ph.D., Berkeley, California, on its Board of Editors. Miss Peck has long been recognized as a leader in the field of special education, particularly the sight-saving class; and Dr. Nyswander, recently with the Office of Inter-American Affairs, is professor of health education, School of Public Health, University of California.

Current Articles of Interest

Prevention and Treatment of Complications of Cataract Surgery, Louis Bothman, M.D., *The Illinois Medical Journal*, March, 1948, published monthly by the Illinois State Medical Society, 715 Lake Street, Oak Park, Illinois.

The author considers the subject of complications of cataract surgery under four headings: prophylaxis; accidents preliminary to operation; complications arising during operation; and postoperative complications.

Among the complications occurring during operation is hemorrhage which can come from the ciliary body, from the iris, seeping into the anterior chamber from conjunctival bleeding, and expulsive choroidal hemorrhage. The most frequent complication arising after the operation is hemorrhage, which usually occurs on the fifth postoperative day due to minor wound rupture and disappears in 24 hours.

Aviation Ophthalmology, Lieutenant Colonel Brittain F. Payne, M.D., F.A.C.S., Medical Corps, A.U.S., *The Military Surgeon*, June, 1947, published monthly by Association Military Surgeons of the United States, 450 Ahnaip Street, Menasha, Wisconsin.

As described in this article, aviation ophthalmology includes the following: eye examination and care of persons engaged in the operation and maintenance of aircraft; visual standards for aviation personnel; preservation of eye health for such personnel; and the initiation of research into the problems peculiar to aviation.

The author provides the following conclusions concerning the subjects of selection, ophthalmic care and rehabilitation:

"1. Ophthalmology in Aviation is unique because of the complex problems with which it deals not ordinarily considered in routine practice.

"2. Aviation medical examiners, whether military or civilian, should strictly adhere to ophthalmic standards for the protection of all concerned.

"3. Courses in Ophthalmology similar to the one at the AAF

School of Aviation Medicine should be required of all medical examiners for civilian or military airlines.

"4. The medical care of the flyer should be supervised by a physician trained in Aviation Medicine.

"5. Considerable medical talent was lost during the past war because of unfortunate assignment and regulations.

"6. The supply of instruments and drugs overseas was woefully inadequate for good ophthalmic practice.

"7. Ophthalmic Consultants should have been commissioned by the Surgeon General and the Air Surgeon at the beginning of the War.

"8. Medical supply and the assignment of personnel would have been more satisfactory with better cooperation and teamwork, and then the elaborate rehabilitation programs could have been diminished in scope.

"9. A definite plan for Military and Aviation Ophthalmology should be outlined at once."

Visual Examinations for School Children, John De Witt Schonwald, M.D., *The Journal-Lancet*, January, 1948, published monthly by Lancet Publishing Co., 514 Essex Building, 84 So. 10th St., Minneapolis 2, Minnesota.

Dr. Schonwald believes that the Snellen visual acuity test at 20 feet is an inadequate means of determining eye fitness of students. The Snellen test determines how well a person can see but is not concerned with the element of eye fatigue. It passes by those persons who, in order to maintain their 20/20 vision, must make abnormal monocular and binocular muscle adjustments. This group of students suffers from fatigue of the ciliary muscle, with which are associated two types of refractive errors, hyperopia and astigmatism of low degree.

Dr. Schonwald feels that this group of students can be screened out readily at the time of taking the Snellen record at 20 feet. He offers the following three suggestions for improving eye testing in schools:

"1. Replace the usual Snellen chart by a small chart having five rows of letters, all of the one size, normally visible at twenty feet. . . .

"2. Visual acuity should be recorded as the greatest distance in feet from the chart where clear vision is possible, and where twenty feet is normal. . . .

"3. Students who have normal vision at twenty feet should be further tested by placing before their eyes a pair of frames fitted with plus 0.75 spheres. . . . Clear vision through glasses indicates hyperopia and suggests that the student should be watched for evidences of eye fatigue.

"An additional test might also be included under some circumstances to detect the presence of astigmatism of low degree. This is accomplished by rotating a crossed cylinder . . . before each eye separately, while standing at the greatest distance from the chart where clear vision is had. Decided differences in visual acuity in any two positions of the crossed cylinder is indicative of astigmatism. . . ."

Optic Atrophy in Hong Kong Prisoners of War, Percy G. Bell, B.A., M.D., F.A.C.S. and J. C. O'Neill, M.D., *The Canadian Medical Association Journal*, May, 1947, published monthly by The Canadian Medical Association, 3640 University Street, Montreal, Canada.

The authors present the findings of a study of optic atrophy from malnutrition, rarely occurring among civilized man. Their report deals with the cases of optic atrophy (a disease occurring for the first time among white men) in war prisoners of the Japanese during the recent war. The findings concerning this disease are summarized by the authors as follows:

"1. Ninety-five cases of partial optic atrophy from malnutrition occurring in liberated prisoners of war from Hong Kong are reported. This is an incidence of 20 per cent.

"2. Twenty-three of these have binocular vision of 20/200 or worse, and incidence of about 4 per cent.

"3. The main finding has been a dense centro-caecal scotoma (in the center of the field) tailing towards the blindspot. The peripheral visual fields were contracted only slightly.

"4. The degree of optic disc pallor has been a very unreliable means of judging the extent of optic nerve damage.

"5. The etiology is discussed and the conclusion is that, besides

the usually accepted hypoproteinaemia and lack of vitamin B complex, there is considerable evidence that a toxin may exist in mouldy rice.

"6. The optic atrophy appears permanent and no change has occurred in our cases over a one-year period."

Effect of Training Methods on Color Vision, J. Roswell Gallagher, M.D., Elek J. Ludvigh, Ph.D., S. Forrest Martin, M.D., Constance D. Gallagher, B.A., *Archives of Ophthalmology*, May, 1947, published monthly by American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

In a discussion of training on American Optical Company plates and on the desaturation test, and their effects on color vision, the authors provide the following summary:

"Forty-nine subjects who had been selected as weak in color vision on the basis of responses to the American Optical Company Pseudo-Isochromatic test plates were subsequently given training on those test plates until all but 4 could satisfactorily pass that particular color vision test. However, although after training perfect responses were made on the American Optical Company test plates by 45 members of this group, only 6 made perfect responses to all the plates in the very similar Ishihara test, and the scores on a color desaturation test, which also had not been practiced, did not improve. A retest on the American Optical Company plates several months later showed a considerable diminution in ability to make correct responses to these plates and indicated that the effects of this type of training may not long persist.

"Six other boys were given the desaturation test, the American Optical Company and the Ishihara color plate tests before and after a period of training on the desaturation device. Five of these subjects showed improvement in their ability to interpret the red and green lights presented by that device after a small number of training periods, but none showed a significant degree of improvement in interpreting the color vision test plates.

"Color vision training apparently is successful in enabling most persons with weak color vision to respond correctly to such a test herein described, but from this study there is no evidence that either of the training methods used improved the capacity to

discriminate between colors in other than the situation in which training was given. Training which enables a person (previously classified as deficient in color vision) to achieve a test rating comparable to that of persons who have normal color vision apparently does not result in the development of the ability to differentiate colors in all situations and under all conditions with the accuracy and speed possessed by those who have normal color vision."

Some Primary Considerations in Retinal Detachment, Based on a Review of 104 Cases, Peter A. Duehr, M.D., *The Wisconsin Medical Journal*, May, 1947, published monthly by the Wisconsin Medical Journal, 917 Tenney Building, Madison 3, Wisconsin.

Dr. Duehr reviews the principles in diagnosis and treatment, describes a method for conservative and operative treatment, and analyzes the data on 104 cases in his report on the subject of retinal detachment. He stresses the importance of early diagnosis since the longer the retina is detached the more difficult it is to reattach it successfully. The diagnosis should indicate whether or not the detachment resulted from direct trauma, since this will determine whether operative or nonoperative treatment will be followed. He describes the use of the diathermy current as the most satisfactory means of reattaching the retina in operative treatment.

The observations on 104 eyes with retinal detachment were made by the members of the staff of the eye department at Wisconsin General Hospital from January 1, 1931 to July 1, 1945. Forty-three cases were unoperated, 41 operated, and 10 reoperated. The remaining 20 were aphakic eyes with detachment. Accompanying tables in this report include such data as: average age of patients and time since onset of detachment; etiologic factors; amount of retina detached; and per cent of successful operation.

The results of operations are shown graphically in a diagram which indicates an increase from 0 to approximately 70 per cent success over a fourteen-year period. Both the total number of reattachment operations and the percentage of success have increased. It is anticipated that with improvements in technique, the outlook for success in the average traumatic and spontaneous detachment will continue to improve.

Ten Years of Fluorescent Fixture Development, R. G. Maurette, *Illuminating Engineering*, March, 1948, published monthly except August and October by the Illuminating Engineering Society, Mt. Royal and Guilford Aves., Baltimore 2, Maryland.

Mr. Maurette reviews the development of fluorescent fixtures during the past decade, a period which he believes represents the greatest advances in lighting ever made in a single decade. The report is broken down into five types of lighting fixtures; industrial fixtures; commercial fixtures; residential fixtures; fixtures for special applications; and custom fixtures. The record of development is reviewed separately for each of these groups.

In conclusion, the author states that, to the present, fixtures have been designed primarily to hold lamps so as to bring light to the proper areas; but that in the future added emphasis will be given to design in order to conform to architecture and color, and to create moods such as restfulness, solemnity, gaiety or business activity.

Industrial Eye Surgery and Treatment—Mechanical Approach, L. C. Potter, M.D., *Industrial Medicine*, July, 1947, published monthly by Industrial Medicine Publishing Company, 605 North Michigan Avenue, Chicago 11, Illinois.

In a Pacific Coast shipyard during World War II, the safety department recorded 10,901 emergency eye cases for one year. Types of eye cases included infections, foreign body accidents, chemical burns, slag burns and trauma of the eye. As a result of the close cooperation between the medical services and the safety department, 99 per cent of these cases were successful in that no loss of sight, annoying scar tissue, or chronic eye diseases resulted.

The above figures support the point which Dr. Potter emphasizes: namely, the necessity for prompt medical relief of eye accidents, and the value of a well-organized safety department in minimizing eye accidents.

Book Reviews

HOW TO INCREASE READING ABILITY. A GUIDE TO DIAGNOSTIC AND REMEDIAL METHODS. Albert J. Harris. New York: Longmans, Green and Co., 1947. xxi, 582 p.

Dr. Harris who is supervisor of the Remedial Reading Service of the Educational Clinic at the College of the City of New York has revised his popular book on remedial reading which was first published in 1940. New chapters have been added, there is new material on reading interests, and a new section contains detailed case studies of reading problems. All the material has been revised and the references have been brought up to date.

This revised edition is a valuable source of information on the causes and correction of reading difficulties shown by school children from elementary grades through the high school years. In every chapter there are many practical suggestions that regular class teachers as well as remedial workers can use. The documentation is excellent. Every chapter contains a comprehensive summary of the latest data on research and experimentation in the field of reading. Controversial issues are considered impartially from different points of view and research bearing on these issues is cited. There is a good account of techniques of word analysis and a helpful section on improving reading comprehension for the reader's varied purposes. The discussion of vocabulary of reading content and other features of readability will assist those who are working on the construction of new texts and reading materials for children. Dr. Harris points out that children need special instruction in learning to use the dictionary and he suggests exercises that can be used for this purpose.

Teachers who work with partially seeing children will find in Chapter 15 suggestions for teaching reading to these especially handicapped children.

A good feature of the book is the listing with annotations of recommended reading tests, practice materials, books for children and selected materials for remedial reading. There are also good illustrations of record forms to be used in summarizing the results

of examinations and observations. At many points in the book, the author's recommendations and suggestions are presented in outline form which makes the text easy to read.

In spite of all the useful information this book contains, the recommended methods seem highly conventional. The techniques described have little tie-up with the best modern practices in classroom instructions. Reading is treated as a series of separate skills, each with its specific drills. There appears to be little connection between some of the devices described and learning with meaning or understanding. There is more attention to reading as a separate school subject than to reading as a tool for learning in and out of school. The possibilities of integration in teaching the language arts as serviceable tools for school projects are largely overlooked. The book is more concerned with techniques to get reading taught than with the pupil whose behavior patterns and personal attitudes count for most in the learning process—whether it is original learning or remedial. One would question the value of some of the artificial devices Dr. Harris describes for motivating reading improvement.

Although the relation between reading disability and linguistic immaturity is pointed out, there is not much material on linking the improvement of reading and language skills in general. More direct suggestions for the prevention of reading disabilities would be a welcome addition to the book.

GERTRUDE HILDRETH, PH.D.

DIAGNOSTIC EXAMINATION OF THE EYE, Conrad Berens, M.D. and Joshua Zuckerman, M.D. Philadelphia: J. B. Lippincott Company, 1946. 711 p. ill.

This work fills a long vacant place on the bookshelf of the ophthalmologist.

Its primary purpose, to describe in detail the standard and special techniques of ophthalmological examination is well accomplished.

The authors emphasize the importance of a detailed general and ophthalmological history. They discuss the reasons for each question and show how apparently insignificant points may be of utmost importance in arriving at a diagnosis.

Step by step the routine procedures are described.

There is a section describing the function and technique of less commonly employed instruments. Much important data is supplied and the book is profusely illustrated.

It seems to the reviewer that the descriptions of disease entities, while instructive, could be omitted as no matter what is included the authors want to assume that the reader has had a good basic knowledge. These descriptions of pathological changes make for discontinuity. The work is decidedly of great value both as a text for study and as a reference book.

JOHN N. EVANS, M.D.

Contributors to This Issue

Robert S. Goodhart, M.D., is Scientific Director of the National Vitamin Foundation, New York, N. Y.

Marcella C. Goldberg is supervisor of the Prevention of Blindness Department, Pennsylvania Association for the Blind, Pittsburgh, Pennsylvania.

C. Edith Kerby is the National Society's associate for statistics and analysis.

Leo Price, M.D., is director of the Union Health Center, International Ladies' Garment Workers' Union, New York, N. Y.

Leslie H. Anderson was formerly executive secretary of The Health Institute of the UAW-CIO, Detroit, Michigan.

Book Reviewers: Gertrude Hildreth, Ph.D., is associated with Teachers College, Columbia University, New York, N. Y.; John N. Evans, M.D., is professor of ophthalmology at Long Island College of Medicine, Brooklyn, New York.